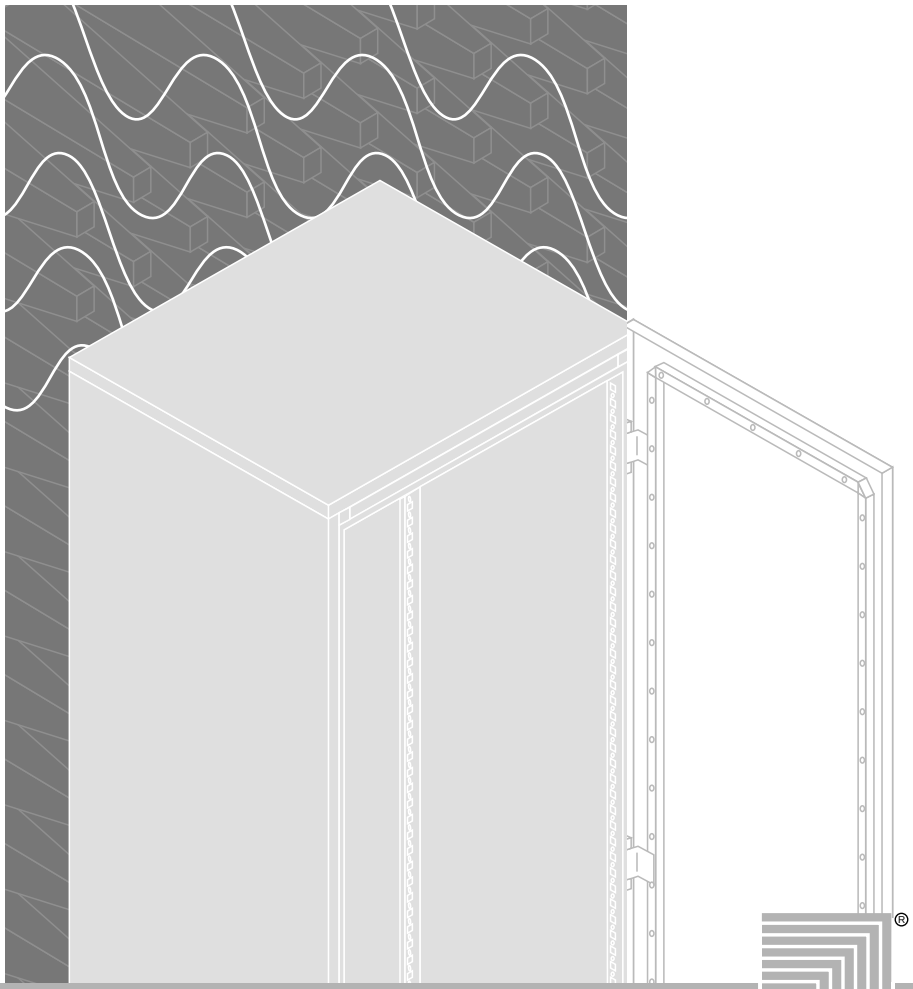
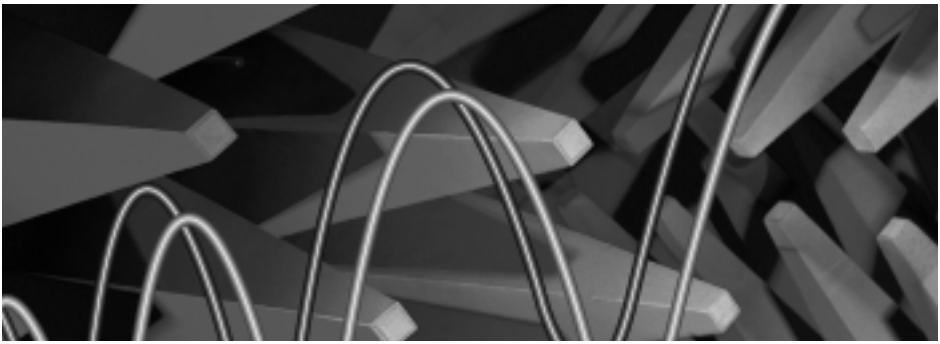
Rittal practical assembly tips

EMC-compatible enclosure assembly



Switch to perfection RITTAL

The Rittal EMC concept



The definition of electromagnetic compatibility (EMC) is the ability of an electrical device to function satisfactorily in its electromagnetic environment without adversely affecting this environment, which may include other equipment.

On the basis of this, the essential requirements of EMC are: To prevent/reduce interference emission **and** to offer defined resistance against interference.

EMC is an indispensable element of quality, and the protection requirements regulated by law, along with the technical risks, EMC must be taken into account at the planning stage when developing equipment.

With the enclosure, as a housing for electrical/electronic controls and systems, the following points must be observed:

– These days, the intelligence contained inside enclosures is becoming ever faster, i.e. shorter switching times and steeper pulse edges, leading to ever higher frequencies of voltages and currents.

– Ever lower energy consumption, i.e. lower voltage/current levels, means that components are more readily influenced by interference.

– The siting of controls in ever more confined spaces, i.e. smaller distances between components and cables, causing ever more frequent interference on different paths.

– Technical progress will exacerbate these risks even further.

A standard enclosure made of coated sheet steel can make a significant contribution towards the EMC of controls for machinery and systems, provided some simple population rules are taken into account.

In applications with **high-frequency field-bound interference,** the use of an RF-shielded enclosure with a superior shielding effect may be required. The only way to draw definite conclusions about the type of enclosure which is necessary or adequate to comply with certain standard limits is by conducting measurements.

This brochure is intended to provide recommendations for EMC-compatible enclosure assembly and usage in machinery and systems for daily workshop practice.

This section contains valuable tips and information on comprehensive potential equalisation.

Comprehensive potential equalisation

This section contains practical suggestions for EMC measures within the enclosure.

Measures within the enclosure

This section tells you the points you should take into account with cabling.

Cabling rules

Explanation of symbols

The following symbols have been used in this manual for illustrative purposes.

We have also assigned system accessories to the drawings, to make ordering easier.

Effectiveness of the EMC measures

very good

good

poor

very poor

Immunity to interference


very sensitive


sensitive

Interference emission


high

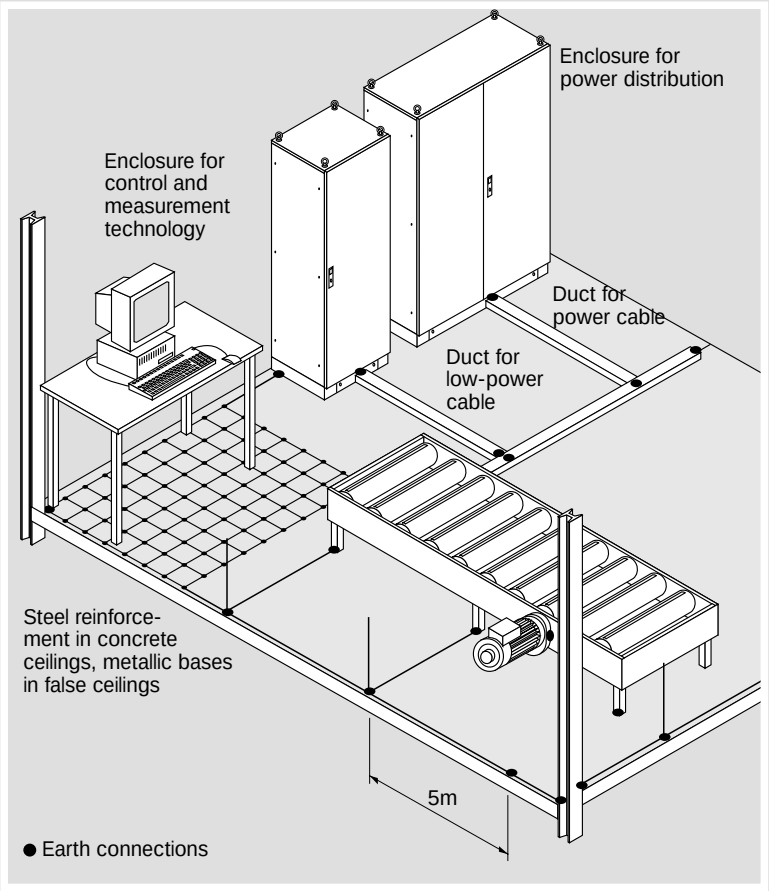

low

Strip paint

Paint surface with contact paint

Comprehensive potential equalisation

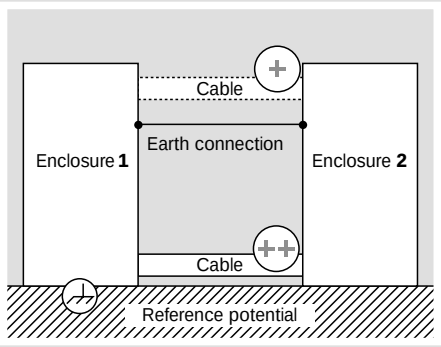
For EMC purposes, ideally there should be low and high-frequency potential equalisation between all metalic masses, enclosures, machine and system components, which should be meshed as closely as possible.

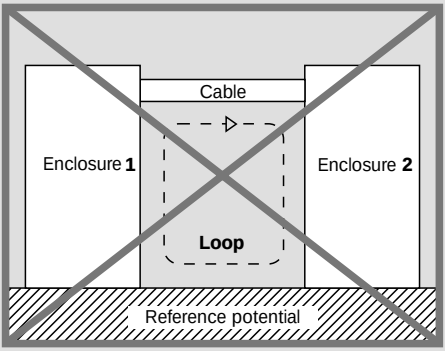


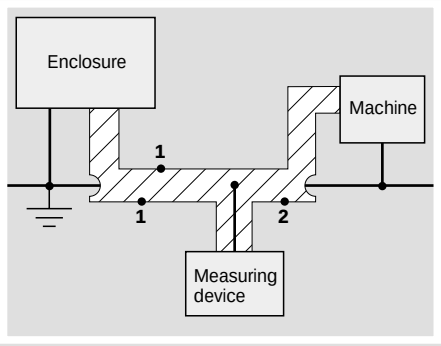
Comprehensive potential equalisation

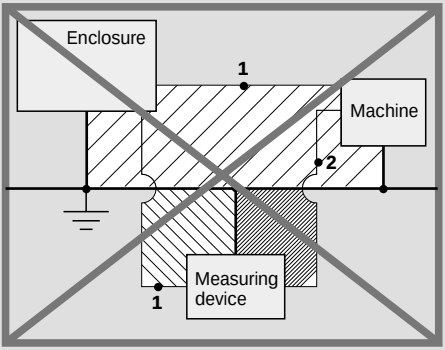
Cable routing in machinery and equipment

Basic principle: Avoid large cable loops; lay current-carrying cables as close as possible to the reference potential.







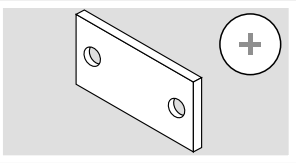


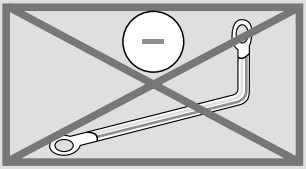
1 Power supply
2 Data/control connection

Comprehensive potential equalisation

Potential equalisation connections

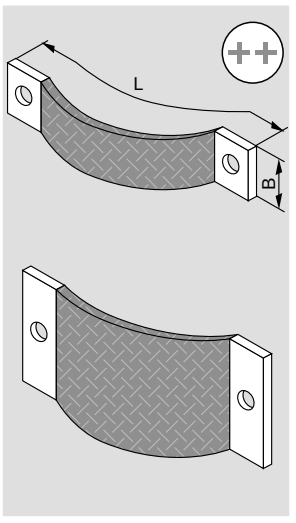
Potential equalisation rail





Green-and-yellow PE conductor

Earthing straps SZ 2412.210 – SZ 2412.325



Ideally:

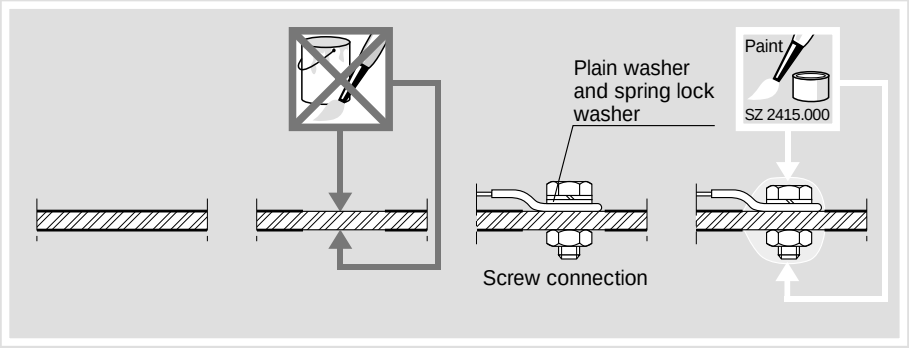
$$\frac{L}{B} < 3$$

In practice: Maximum possible cross section, large-area conductive mounting, low-inductive (therefore, a rectangle is better than a round conductor)

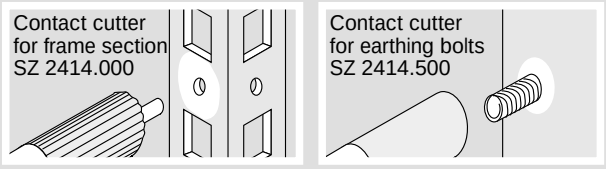
Comprehensive potential equalisation

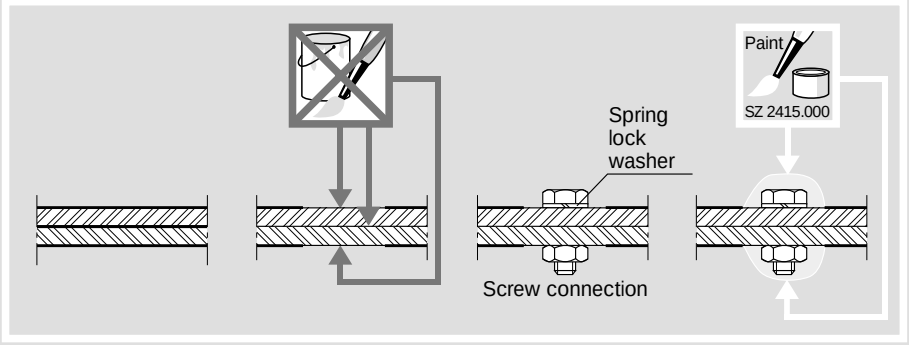
Potential equalisation connections

How to attach earthing straps



Preparation
of the contact points

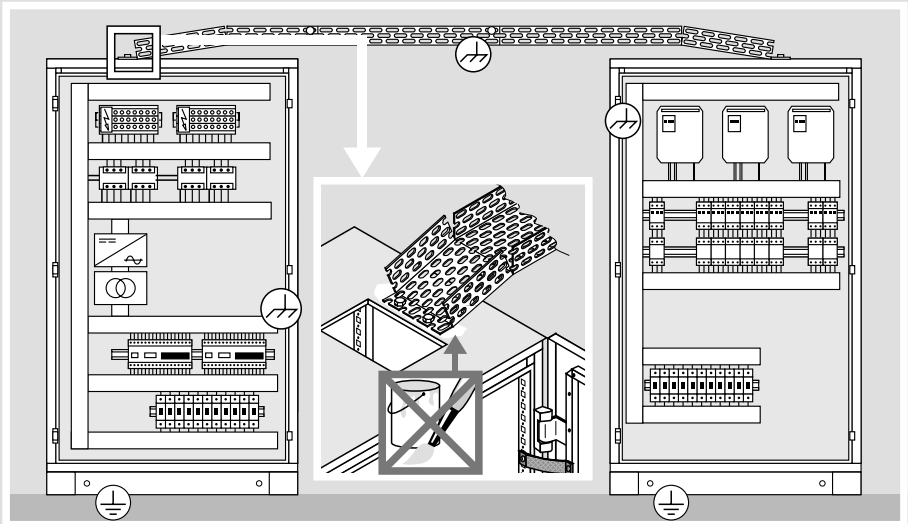


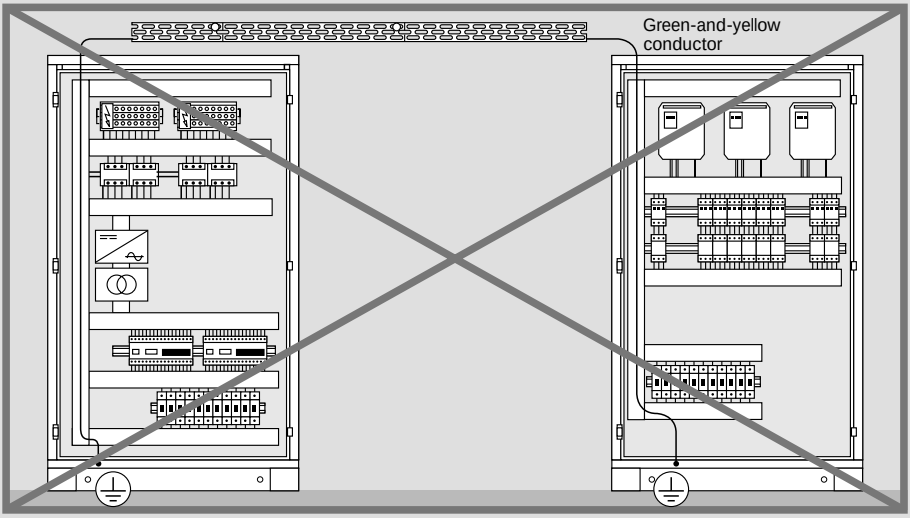


How to screw-fix metallic parts

Comprehensive potential equalisation

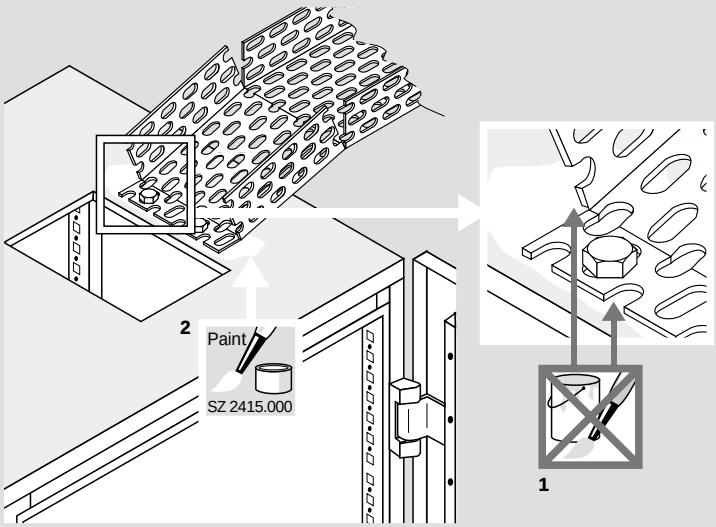
Potential equalisation between enclosures via a metallic cable duct





Comprehensive potential equalisation

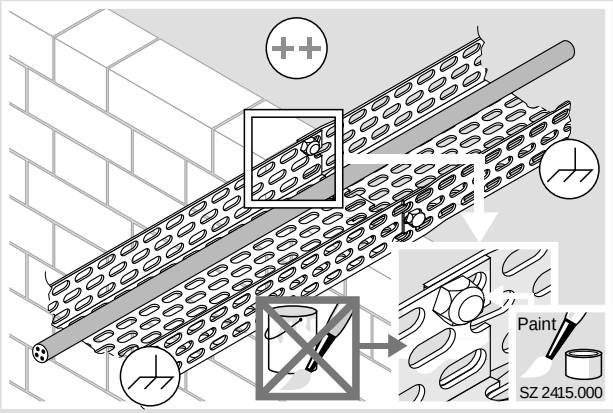
How to connect metallic cable ducts to the enclosure

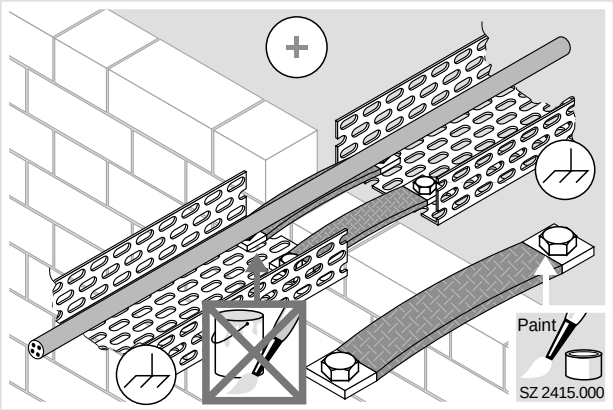


1 Conductive connection
2 Contact paint provides protection against corrosion

Comprehensive potential equalisation

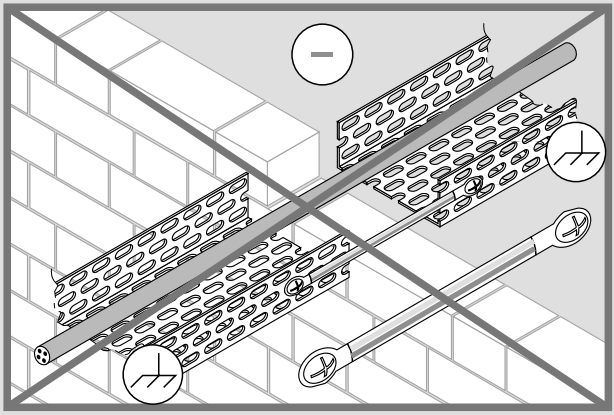
Conductive connection of metallic cable ducts

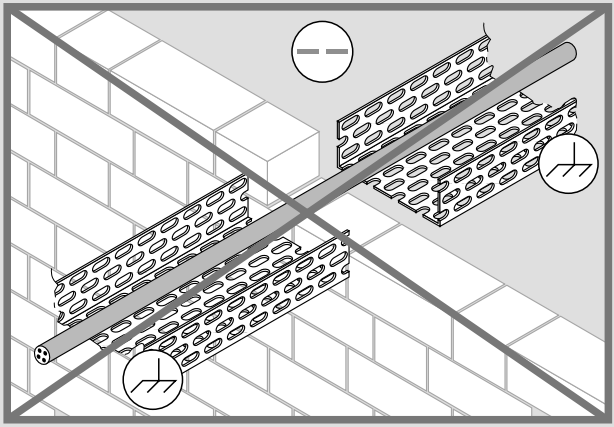




Comprehensive potential equalisation

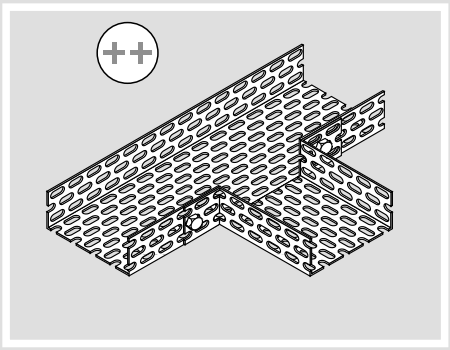
Conductive connection of metallic cable ducts

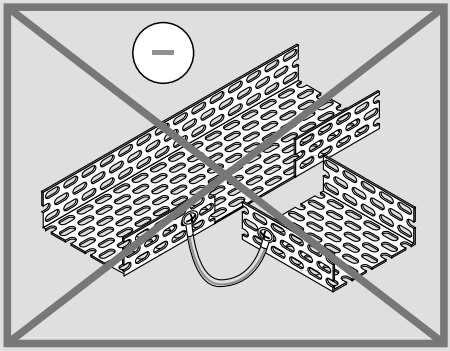


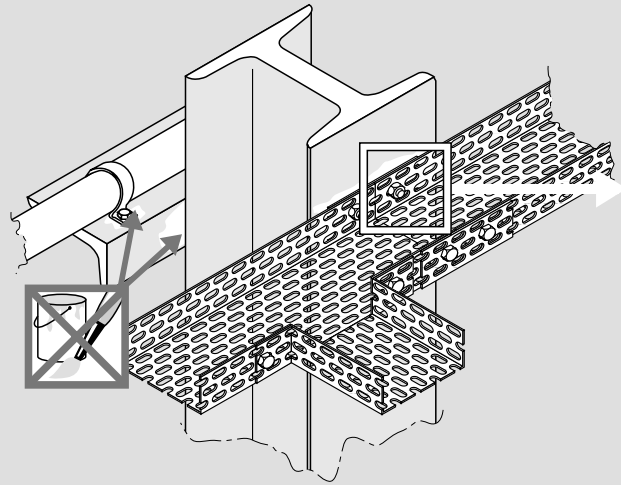


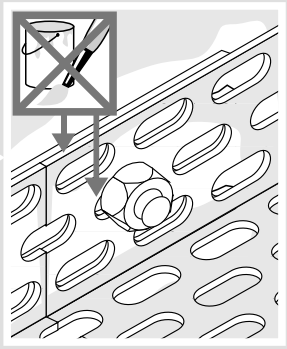
Comprehensive potential equalisation

Conductive attachment of metallic cable ducts



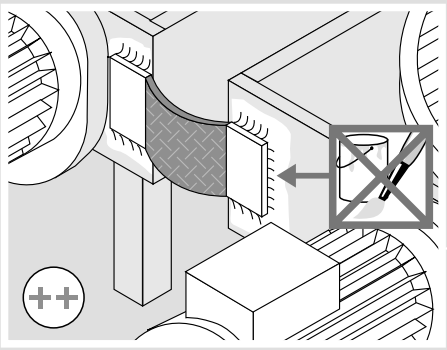




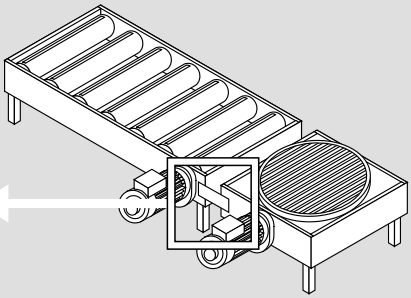


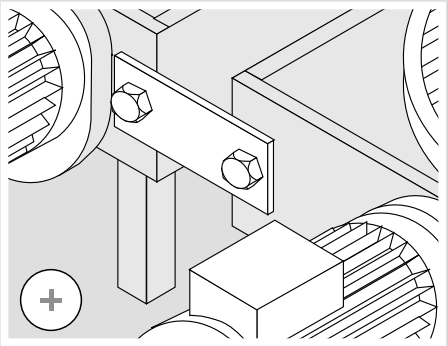
Comprehensive potential equalisation

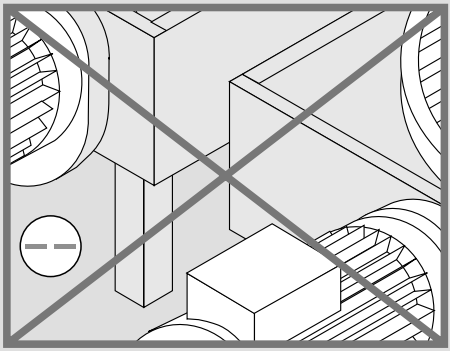
Conductive connection between machine and system components



Welded earthing strap

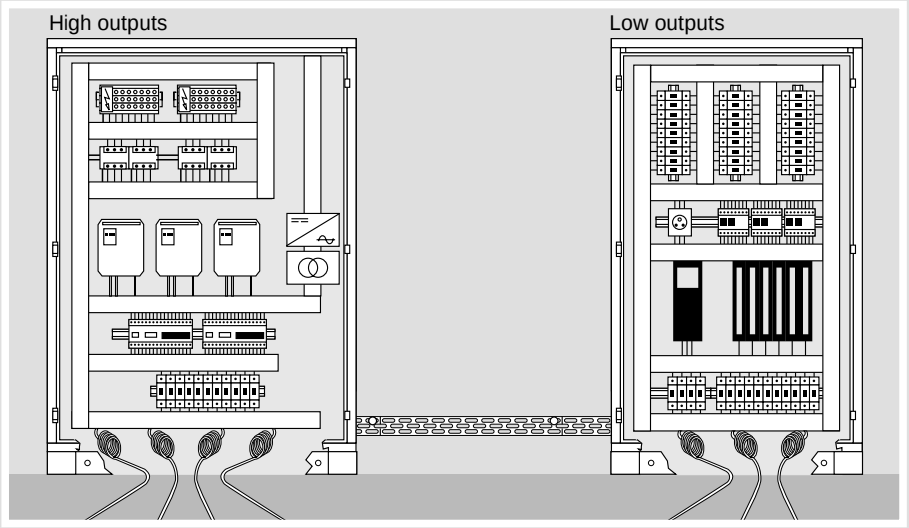


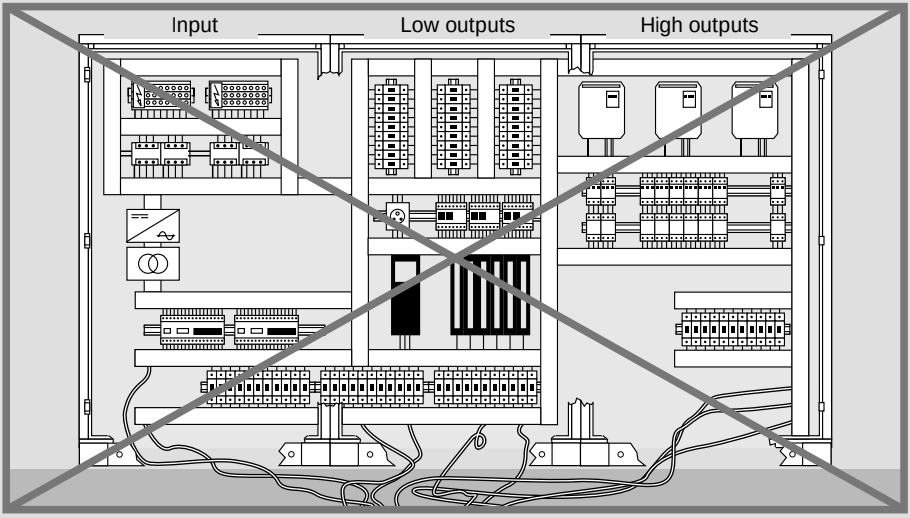




Measures within the enclosure

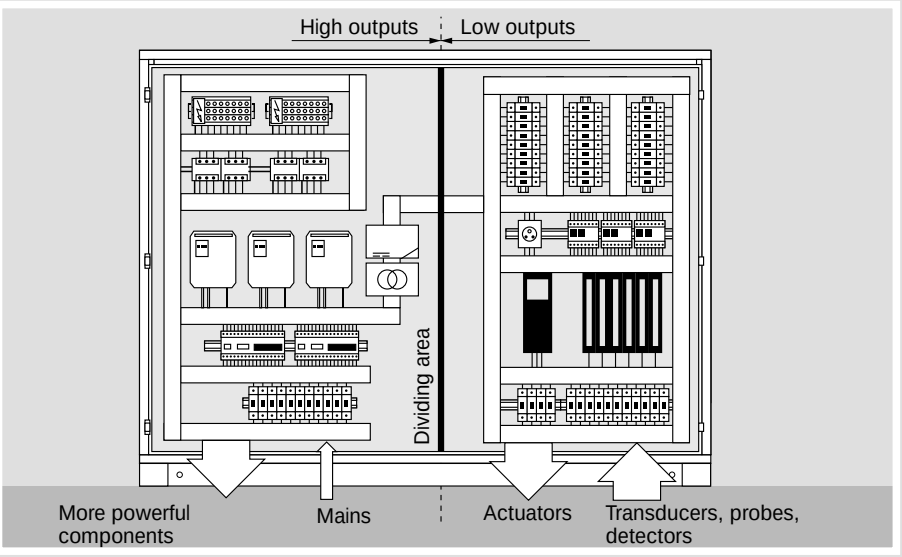
Functional enclosure layout / spatial division



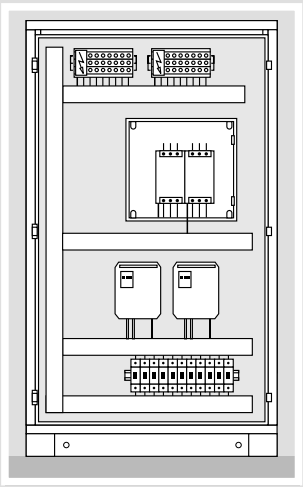


Measures within the enclosure

Functional enclosure layout, division via internal partitions

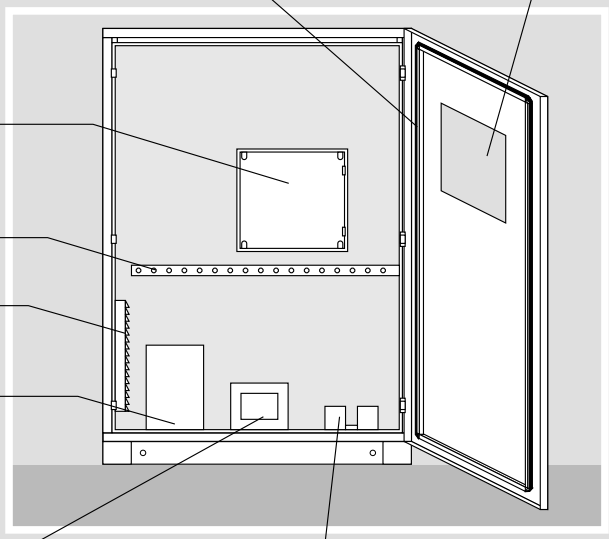


Protect sensitive assemblies by means of encapsulation, shielded case/subrack within the enclosure



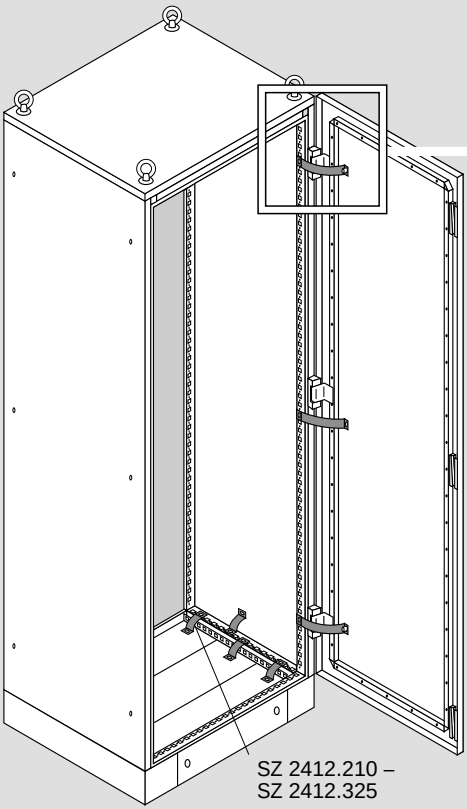
Measures within the enclosure

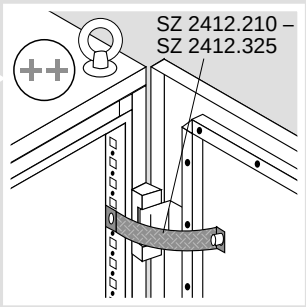
For optimum shielding effect:



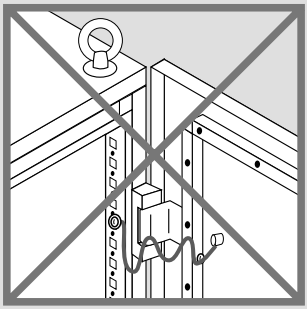
Measures within the enclosure

Improve the shielding effect via optimum potential equalisation of the enclosure surfaces





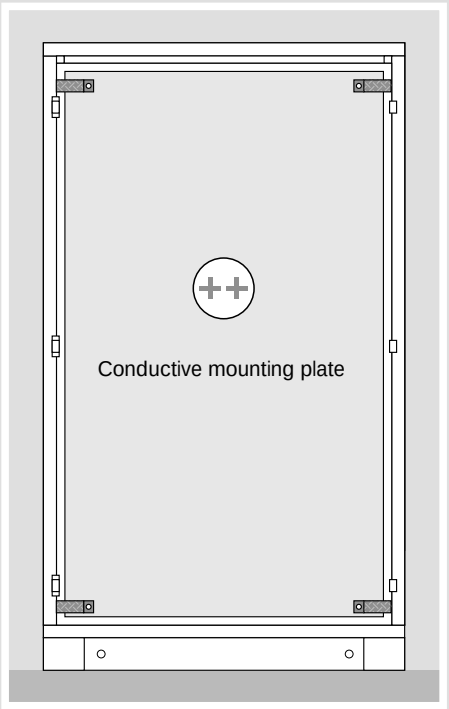
EMC earthing straps

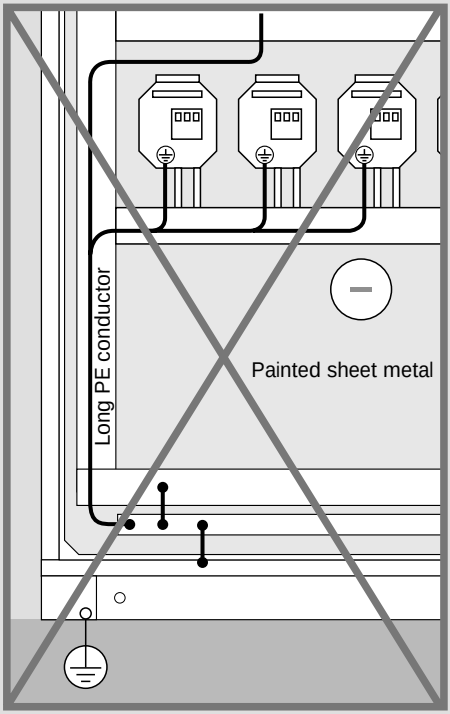


Earth straps

Measures within the enclosure

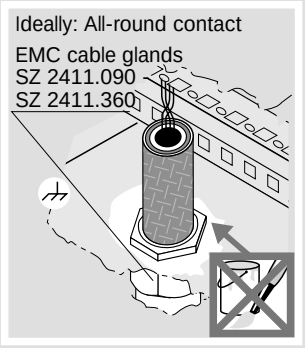
The mounting plate as a potential equalisation surface: all components with a conductive housing can be conductively mounted with a large contact area.

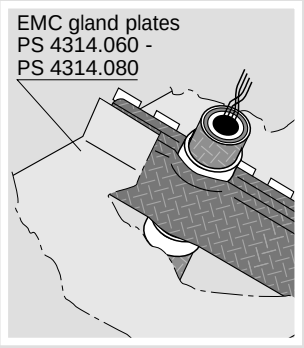


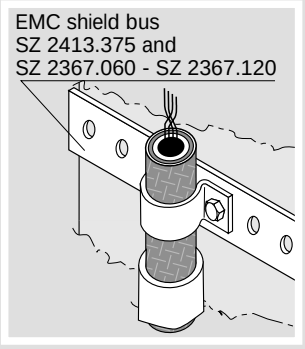


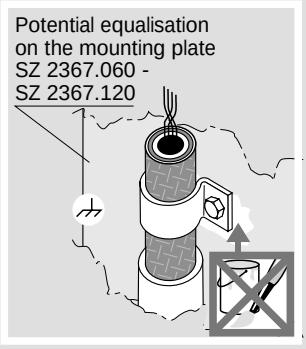
Measures within the enclosure

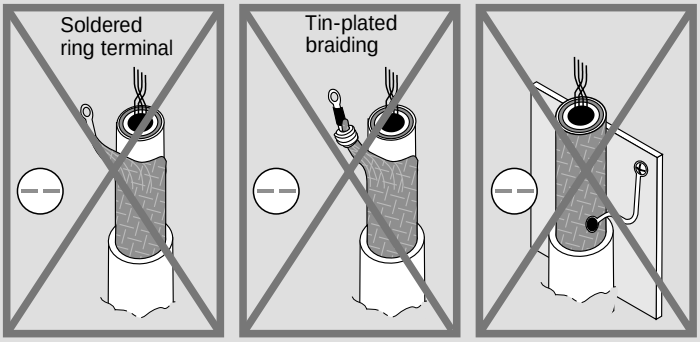
Cable shields should be contacted directly at the point of cable entry, where possible





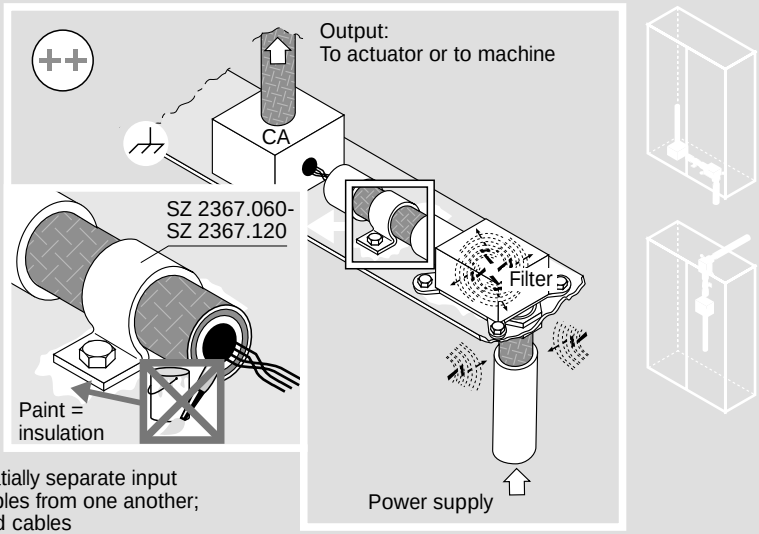




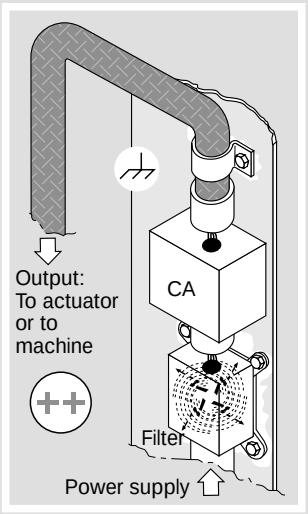


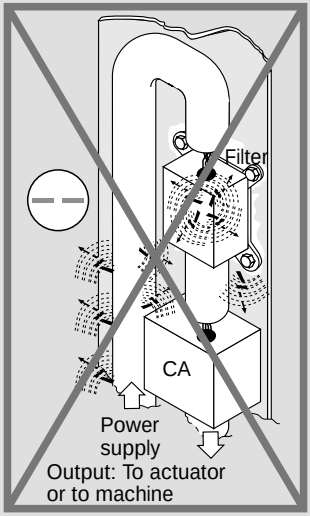
Measures within the enclosure

Conductive arrangement of mains filters on gland plates or mounting plate, cable shield contacting on gland plates or mounting plate



Important: Spatially separate input and output cables from one another; use as shielded cables

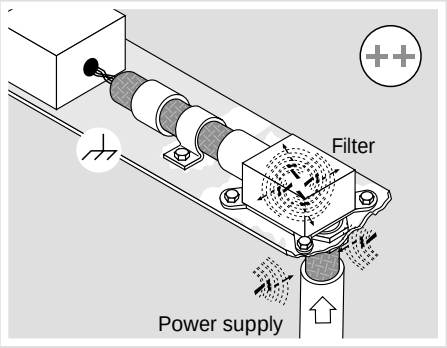


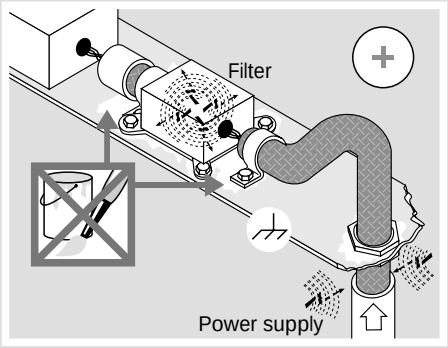


CA = control assembly

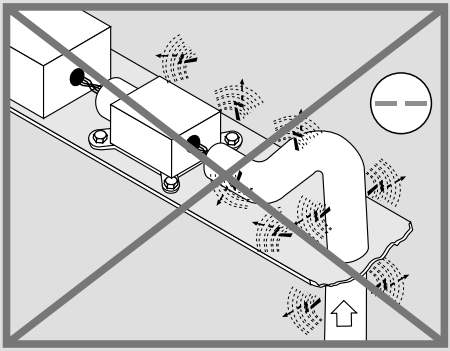
Measures within the enclosure

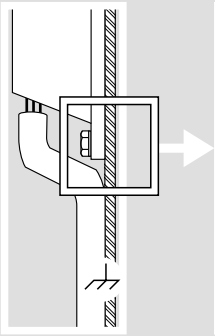
Position filters directly at the point of enclosure entry/exit, where possible

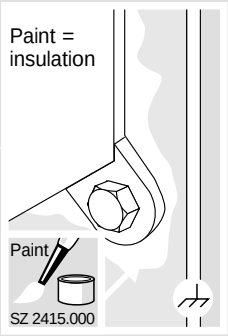


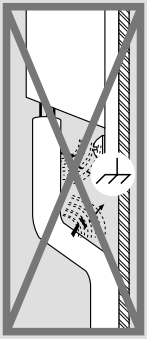


Important: Ensure there is large-area conductive connection between the filter housing and the mounting surface; avoid cable loops to the reference potential



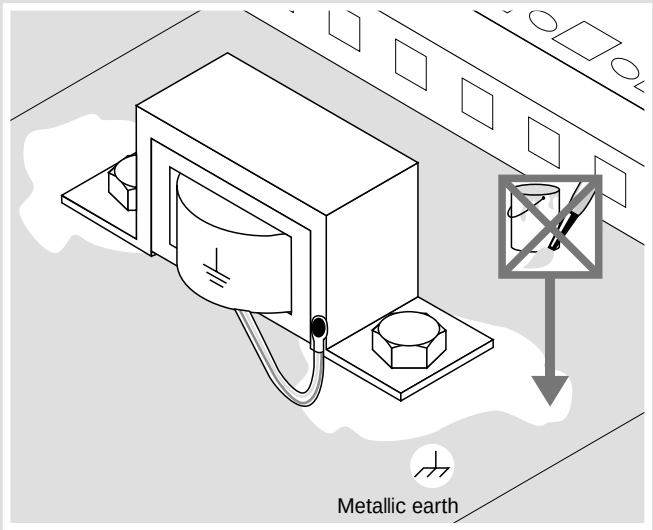


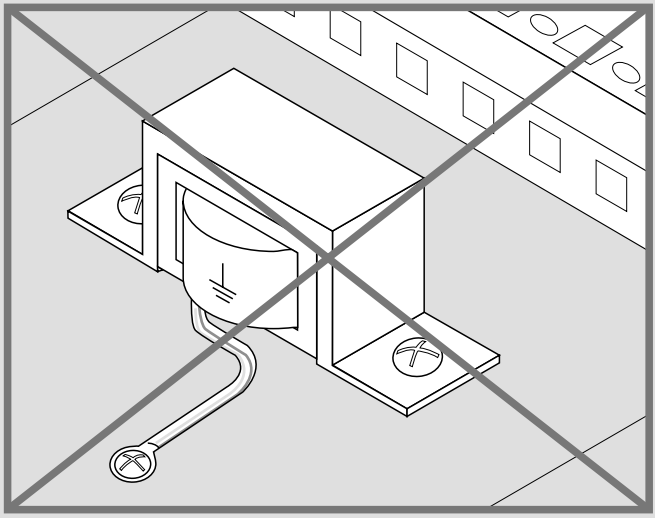




Measures within the enclosure

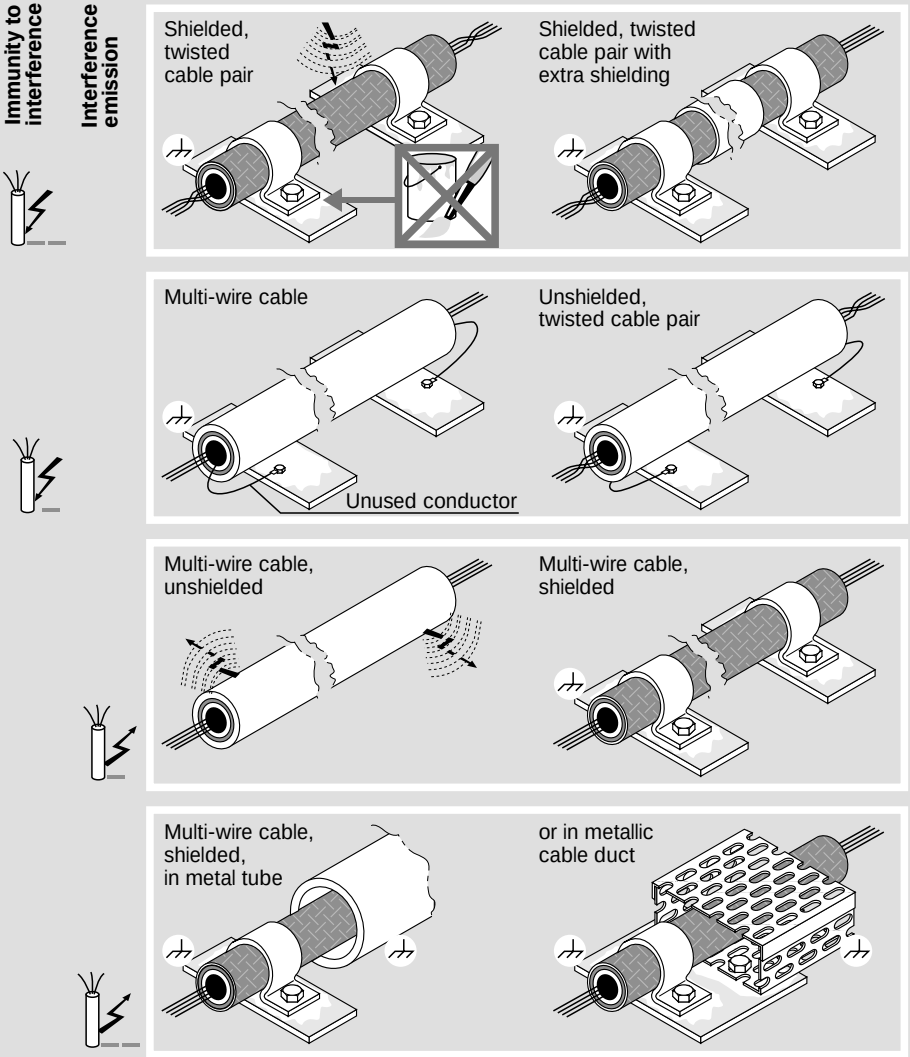
Position transformers on gland plates with large-area conduction, conductive connection of the shield





Cabling rules

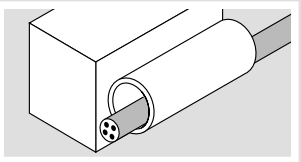
Cable selection / routing

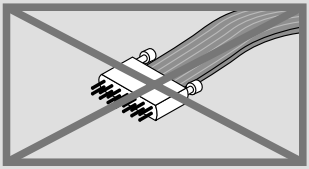


Cabling rules

Cable routing between enclosures and machine/system parts

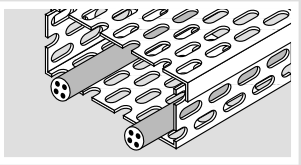
Steel conduit

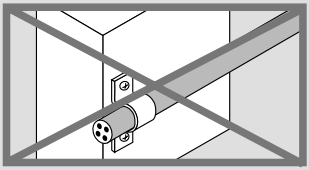




Sheathings, open laying of bus cables etc.

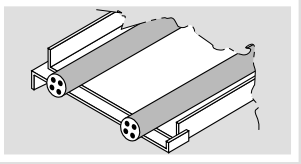
Steel cable duct

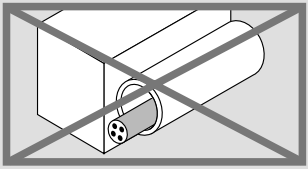




Surface cabling with cable clamps or other fixing components

Cable trays or sheet steel supports

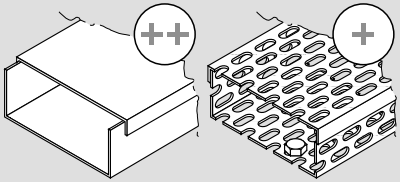




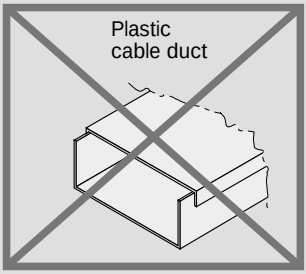
C cable tube, surface-mounted

Routing of cables in the cable duct
Selection/population of cable ducts

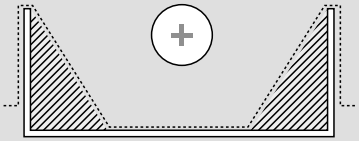
Solid
metallic cable duct



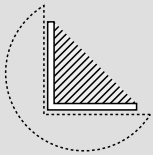
Plastic
cable duct



Open metallic cable duct



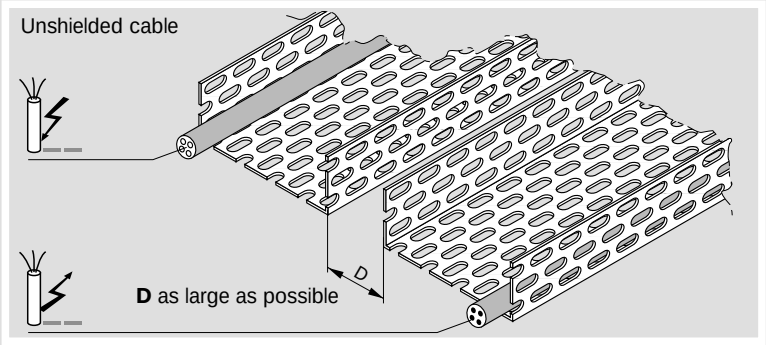
Open mounting angle

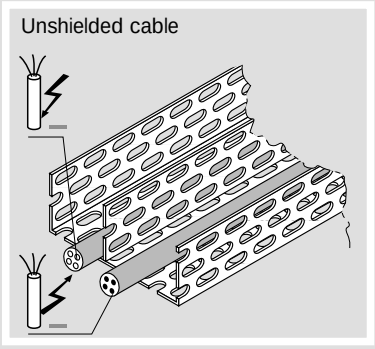


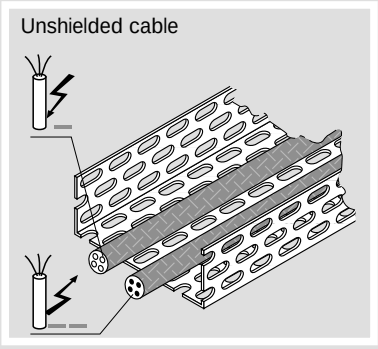
Areas with effective shielding
against electromagnetic fields

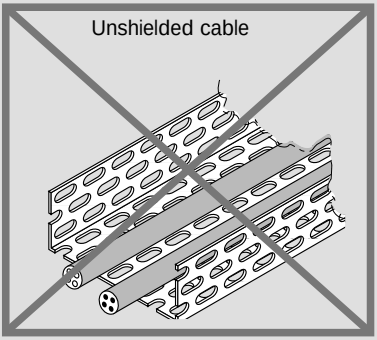
Cabling rules

How to route cables with different interference emission and interference sensitivity in cable ducts









Immunity to interference

Very sensitive

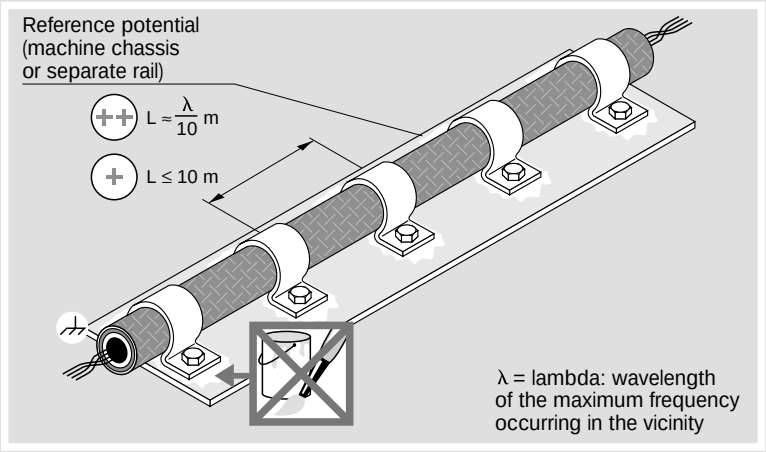
Sensitive

Interference emission

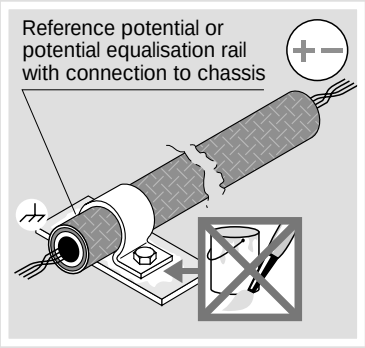
High

Low

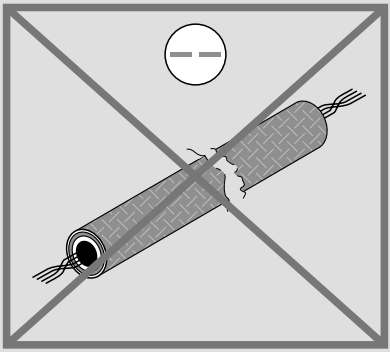
Shield contacting to potential equalisation



Cable shield with
potential equalisation on one side

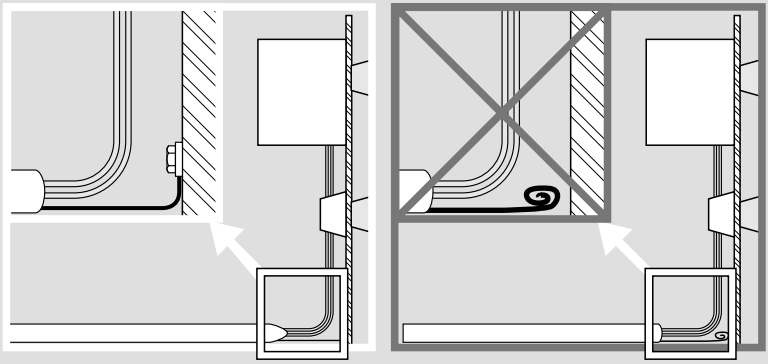


Cable shield without
potential equalisation contact

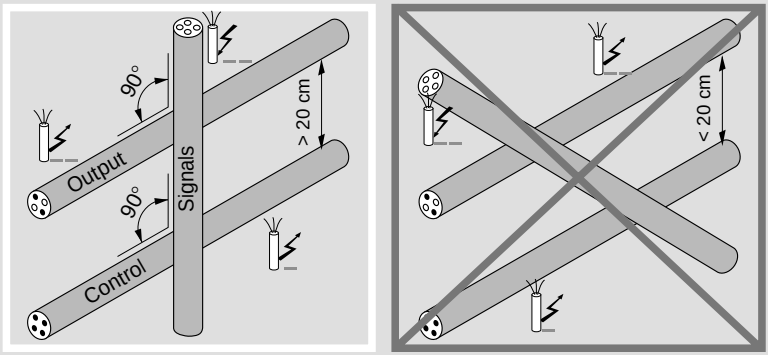


Cabling rules

Cable routing



Connect unused conductor to reference potential



Use right-angled cable cross-overs wherever possible, and ensure adequate distance between interference-emitting and sensitive cables

Fix it by fax:

Simply copy and complete this form, and fax it us!

From:

Surname _____ First name _____

Company _____ Department _____

Road _____

Town / post code _____

Telephone _____ Fax _____

Request for information:

☐ Please send me more information about:
- ☐ EMC subracks
- ☐ EMC instruments cases
- ☐ EMC wall-mounted enclosures
- ☐ EMC enclosure systems
- ☐ EMC fan-and-filter units

☐ Please telephone me to arrange an appointment.
My extension is:

_____

☐ Please send me …… additional copies of this brochure.

Reliable protection against interference

New! Ripac Microcomputer Packaging System:
The complete subrack solution with the comprehensive EMC concept.

Play it safe with the Rittal EMC range.
Sophisticated standard products for EMC-compatible packaging of electrics, electronics and data communications provide reliable protection against electromagnetic interference. Rittal EMC solutions are available as:

- EMC subracks
- EMC instrument cases
- EMC wall mounted enclosures
- EMC enclosure systems
- EMC fan-and filter units
- and a wide range of EMC accessories.

Rittal-Werk · Rudolf Loh GmbH & Co. KG · P.O. Box 16 62 · D-35726 Herborn
Telephone (0 27 72) 5 05-0 · Telefax (0 27 72) 5 05-23 19
eMail: Info@rittal.de · Internet: http://www.rittal.com

12/97